grooves due to the angle of illumination used to obtain the visible images. By using the infrared images to detect and eliminate artifacts and make local corrections to features in the visible images, the resulting matching of visible tool mark images against a database of similar images produces more accurate matching with a greater number of located matches. Since current databases of tool marks, including ballistic signatures, contain visible images only, the use of infrared analysis may be initially limited to pre-processing new images compared with and added to the databases.

As infrared camera prices are reduced, it is predicted that the IR analysis methods of this patent will become the standard matching technique, due to their significant advantages. Infrared analysis of tool marks provides classification, alignment, characterization, comparison, matching and identification of such marks with better specificity and repeatability than analysis in the visible spectrum. In the case of ballistics item matching, the proposed method and apparatus can automatically extract and characterize the marks associated with a particular manufacturing process or caused by a particular weapon including: striations, firing pin indentation, breech, extractor and ejector marks, resulting in more accurate automated matching against databases of bullets, casings, and weapons.

The method can be enhanced by active infrared imaging which includes heating or cooling the item under examination to enhance markings which have different depths of surface features or which are caused by differing emissivities due to surface abrasion or due to differing materials. The method can also be enhanced by imaging using a range of spectral filters. This provides compositional analysis of the material of the ballistic item and the nature of any identified debris on the item] imaging characterizes marks made on items and identifies the particular marking tool with better accuracy than use of visual imaging. Infrared imaging performed in total darkness eliminates shadows, glint, and other lighting variations and artifacts associated with visible imaging. Although normally used to obtain temperature